

ATTACHMENT A**GAS DEFLECTOR FOR AN AIR-BAG**CROSS REFERENCE TO RELATED APPLICATIONS

**[0001]** This application claims priority to Great Britain patent application 0322519.0, filed September 25, 2003 and PCT/SE2004/001266 filed September 3, 2004.

FIELD OF THE INVENTION

**[0002]** The present invention relates to a gas deflector, and more particularly relates to a gas deflector for use with a gas generator configured to supply gas to inflate an air-bag, such as an air-bag provided in a motor vehicle to provide protection to a vehicle occupant in the event that a vehicle collision should occur.

**[0003]** Many gas generators utilised as inflators for air-bags are of a generally cylindrical form. Typically such a gas generator is provided with a plurality of apertures formed in the outer wall of the gas generator, and on actuation of the gas generator, gas flows in a radially outward direction through these apertures. However, in many cases, it is most desirable for gas from the gas generator to flow into the associated air-bag with a flow direction which is substantially parallel to the longitudinal axis of the cylindrical gas generator. Consequently there is a need for a gas deflector which will deflect the radially outwardly flow of gas emanating from the gas generator and convert that flow of gas into a gas flow which is substantially parallel with the axis of the gas generator. In some cases, the requirement is more complicated, since the flow of gas flowing in one direction substantially parallel to the

gas generator is to be greater than the flow of gas flowing in the opposite substantially parallel direction.

#### SUMMARY OF THE INVENTION

**[0004]** The present invention seeks to provide an improved gas deflector.

**[0005]** According to the present invention, there is provided a gas deflector for use with a cylindrical gas generator, the gas deflector including a generally tubular housing, to accommodate a cylindrical gas generator, the housing having two terminal portions of generally circular cross-section and having an intermediate region provided with an outwardly extending formation, the outwardly extending formation defining, at either end thereof, an opening through which gas may flow in a direction substantially parallel to the axis of the housing.

**[0006]** Preferably, the gas deflector is provided with a mounting stud.

**[0007]** Advantageously, part of one end region of the housing is cutaway to receive a mounting stud on a gas generator.

**[0008]** Conveniently, one of the gas outlet openings defined by the outwardly extending formation is of a greater cross-sectional area than the other of the openings formed by the formation.

**[0009]** Preferably the formation is a formation which extends radially outwardly in a bridge-like manner.

**[0010]** Advantageously, the outwardly extending formation has a first portion and a section portion, the first portion having a greater radial extent than the second portion and thus defining the aperture of greater cross-sectional area.

**[0011]** Conveniently, the formation has an inclined outer wall, thus being of substantially tapering form, one end of the formation defining the above-mentioned

relatively large cross-section aperture and the other end defining the relatively small cross-section aperture.

**[0012]** Another aspect of the present invention provides a gas deflector as defined above in combination with a cylindrical gas generator received within the gas deflector, the cylindrical gas generator having at least one gas outlet aperture formed in the side wall thereof in a region aligned with the above-mentioned formation, the gas generator having an external diameter substantially equal to the internal diameter of the terminal regions of the deflector.

**[0013]** Preferably, the gas generator is provided with a mounting stud, the mounting stud being received within a cut-away region of the gas deflector housing.

**[0014]** Another aspect of the present invention provides an air-bag incorporating a gas deflector and gas generator combination as defined above, wherein the air-bag defines two internal chambers, one opening of the deflector communicating with one of the chambers and the other of the openings communicating with the other of the chambers.

**[0015]** Preferably, part of the air-bag is clamped to the exterior of the gas generator so that the chambers are substantially sealed from each other.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

**[0016]** In order that the invention may be more readily understood, and so that further features thereof may be appreciated, an embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings in which:

**[0017]** FIGURE 1 is a diagrammatic view of a side air-bag for use with a motor vehicle illustrating a gas generator (in phantom) and gas deflector in accordance with this invention;

**[0018]** FIGURE 2 is a perspective view of the gas generator and gas deflector assembly of Figure 1;

**[0019]** FIGURE 3 is a sectional view through the gas deflector of the assembly of Figure 2; and

**[0020]** FIGURE 4 is a side view of the gas deflector of the assembly of Figure 2.

#### DETAILED DESCRIPTION OF THE INVENTION

**[0021]** Referring initially to Figure 1 of the accompanying drawings, a side air-bag assembly 1 is illustrated. The side air-bag assembly 1 is intended to be mounted in position in the back rest of a vehicle seat or in the side wall of a motor vehicle adjacent to the vehicle seat so that the air-bag, when inflated, is located between the seat occupant and a side part of the motor vehicle. The air-bag assembly includes an air-bag 1A formed from two super-imposed layers of fabric 2 and 3 which, in the described embodiment, are interconnected by a notional fold or hinge line 4. Each of the layers of fabric 2 and 3 is of the same shape and size, and the layers are folded about the notional fold line 4 and are interconnected by means of a seam 5. The seam 5 extends around the periphery of the super-imposed layers 2 and 3 and includes a re-entrant portion 6 which extends substantially transversally across the air-bag 1A, dividing the air-bag into an upper chamber 7 and a lower chamber 8. The lower chamber 8 is provided with an inlet opening or throat 9 through which an assembly 10 which includes a gas generator and a gas deflector (as will be described in greater detail below), may be introduced to the interior of the air-bag 1. The assembly 10 is provided with two protruding mounting studs 11 and 12 which extend through respective apertures provided in the fold line 4 to enable

the assembly 10 together with the complete air-bag assembly 1 to be mounted in position in the motor vehicle.

**[0022]** The re-entrant portion 6 of the peripheral seam 5 is provided with an aperture 13 and a clamp may be introduced through the aperture 13, the clamp (not shown) being of ring-like form, the clamp being configured to bring the innermost end of the re-entrant portion 6 of the seam 5 into firm engagement with the exterior of the assembly 10 thus effectively sealing the upper chamber 7 from the lower chamber 8.

**[0023]** It is to be observed that the throat 9 is provided with a closure flap 14 which itself incorporates an aperture 15. The closure flap 14 may be folded closed after the assembly 10 has been inserted into the air-bag 1A, with the aperture 15 engaging the mounting stud 11.

**[0024]** As will be described hereinafter, the assembly 10 is such that, on actuation of the associate gas generator 20, gas will be directed substantially upwardly, generally as indicated by the arrow 16, into the upper chamber 7, and gas will also be directed downwardly, generally as indicated by the arrow 17 into the lower chamber 8.

**[0025]** When the air-bag 1A is mounted in position and inflated, the lower chamber 8 may be located adjacent the pelvis of the seat occupant and the upper chamber 7 may be located adjacent the thorax of the seat occupant. The upper chamber 7 may be inflated to a pressure which is greater than the pressure to which the lower chamber 8 is inflated.

**[0026]** Turning now to Figures 2 and 4, the assembly 10 includes a cylindrical gas generator 20. One end of the cylindrical gas generator 20 is provided with a plug 21, which can receive an appropriate connector so that a signal may be passed to the gas generator to actuate the gas generator in a manner which is well known.

**[0027]** The gas generator 20 is provided, at a point intermediate its two ends, with a plurality of gas outlet apertures 23 (which can be seen on the phantom line view of gas generator 20 in Figure 3). The gas generator 20 is also provided with one of the mounting studs 11.

**[0028]** Associated with the gas generator 20 is a gas deflector 24. The gas deflector 24 is of generally hollow cylindrical form and defines a generally tubular housing to accommodate the gas generator 20. The gas deflector 24 carries the other of the mounting studs, namely mounting stud 12. The gas deflector 24 has two opposed terminal regions 25 and 26 which are of substantially circular cross-section, the internal diameter of the terminal regions 25 and 26 being only very slightly greater than the external diameter of the cylindrical gas generator 20. One terminal region 26 is provided, at the free end thereof, with a "cutaway" region 27, the cutaway region 27 being positioned so that when the gas generator 20 has been inserted into the gas deflector 24, the mounting stud 11 carried by the gas generator will be received within the cutaway region 27. Because the stud 11 is received within the cutaway 27, the gas generator cannot rotate, about its longitudinal axis, relative to the gas deflector 24.

**[0029]** Intermediate the two opposed terminal end regions 25 and 26, the gas deflector 24 is provided with a formation 28 which has a greater outward radial extent than the terminal regions 25 and 26. In the described embodiment, the formation 28 has a first outwardly directed region 29, located adjacent the first terminal end region 25, and separated therefrom by means of a slit 30. The effect, consequently, is that at the end of the outwardly extending region 29 adjacent the end region 25 an opening or aperture 31 is formed as can be seen most clearly in

Figure 2. The opening 31 is directed towards the end of the gas generator 20 which is provided with plug 21.

**[0030]** Thus, as viewed from the end of the assembly 10, the outwardly directed formation 29 visually resembles a bridge, with the aperture 31 being defined beneath the bridge constituted by the outwardly directed region 29 and the terminal region 25.

**[0031]** The second part of the formation 28 is another outwardly directed region, this being an outwardly directed region 32 which is separated from the adjacent terminal region 26 by means of a slit 33. The region 32 extends radially outwardly, but not to such an extent as the region 29. An opening or aperture 34 (see Figure 3) is thus created, and the opening 34 is such that if the assembly is viewed from the other end, that is to say the end remote from the plug 21, again the outwardly extending portion 32 appears as a bridge, the bridge extending over the aperture 34.

**[0032]** As can be seen most clearly from Figure 3, the outwardly directed regions 29 and 32 are, in this embodiment, interconnected by a step formation 35. However, as an alternative, it is also envisaged that the formation 28 could have an inclined outer wall, thus being of substantially tapering form between the two regions 29 and 32. As another possible alternative, it is also envisaged that the formation 28 could have a straight wall substantially parallel to the outer wall of the gas generator, in which case, the two openings 31 and 34 will be substantially identical to one another.

**[0033]** It is thus to be understood that on actuation of the gas generator 20, gas will flow radially outwardly through the apertures 23 into the interior of gas deflector 24. Gas will then flow axially along the assembly 10, flowing parallel to the

central longitudinal axis 38 of the gas deflector housing. A relatively large flow of gas will emerge through the opening 31, as this opening is relatively large, that flow of gas flowing in the direction illustrated by the arrow 16 into the upper chamber 7. A smaller flow of gas will flow through the opening 34 in the direction indicated by the arrow 17 into the lower chamber 8.

**[0034]** Whilst, in the described embodiments, the apertures 31 and 34 have been illustrated in the form of a generally "crescent" shape, in alternative embodiments of the invention, the apertures may be triangular or even rectangular, depending upon the configuration of the outwardly directed regions 29 and 32. The use of convex or concave forms for the openings 31 and 34 is also possible.

**[0035]** A gas deflector as described above may be fabricated by taking the generally cylindrical "blank" of metal, cutting two slits into the exterior of the blank, each slit extending part way round the circumference of the blank, and inserting a deforming and shaping tool into the blank, then driving the shaping and deforming tool radially outwardly between the slits, the shaping and deforming tool being configured to deform the exterior wall of the blank to produce the formation 28 as described above. Alternatively the deflector 24 can be manufactured by taking a flat sheet which is cut to the right length, providing the sheet with appropriate slits, subsequently pressing the region of the sheet between the slits to form the formation 28 as described above, the sheet subsequently being rolled to form a tube form, with the then adjacent edges of the sheet being secured together, for example by welding.

**[0036]** A further alternative technique would be to produce a tubular blank, to cut an appropriate opening in the side wall of the blank and to weld a pre-formed



structure, equivalent to the structure 28, into the opening formed in the wall of the blank.

**[0037]** While the above description constitutes the preferred embodiment of the present invention, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope and fair meaning of the accompanying claims.